Layering for Equity and Efficiency:
A Principled Approach to Universal Service Policy

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This report was prepared on behalf of America OnLine, Inc., and was filed with the U.S. Federal Communications Commission as a Reply Comment to Report to Congress on Universal Service, CC Docket No. 96-45, DA 98-2. The report can be found on the FCC Web site, as http://www.fcc.gov/Bureaus/Common_Carrier/Comments/report2congress/rtcreply.zip. The opinions expressed herein are solely my own, and may not represent the views of America OnLine, Inc.

TABLE OF CONTENTS

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Prof. Jeffrey K. MacKie-Mason

"*The Internet is a virtual network that is built on top of facilities and services provided by telecommunications carriers.*"[1]

I. INTRODUCTION

I am Jeffrey K. MacKie-Mason, Associate Professor of Economics and Information at the University of Michigan. I have been asked by American OnLine, Inc., to prepare this study of the economics of taxation and expenditure for the Universal Service Fund. The opinions expressed herein are solely my own. I have provided a short biography as an attachment.

In this report I will not analyze nor dispute legal or regulatory interpretations of the 1996 Telecommunications Act. Instead, I present an economically sound approach to USF assessments and distributions. The driving objectives for my analysis are competitive neutrality and efficiency. I take a viewpoint that is forward-looking.

I find that a principled, forward-looking approach to telecommunications taxation and regulation requires a distinction between basic services, and advanced services that are built on top of the basic services. USF contributions are already made for every communication channel involved in Internet access. To impose a new obligation for USF contributions on Internet service providers would be to introduce discriminatory double-taxation directly on Internet users. Further, imposing direct USF contribution on ISPs would be harmful to competition because the taxes would not be equitably applied to competing information service providers. As for distribution of the USF, it is important — as it is in general in tax and expenditure analysis — to separate those who are taxed from those who participate in providing the programmatic benefits. The intent of USF is to benefit consumers; the greatest benefit for consumers will come from having the widest possible choice of providers.

II. A PRINCIPLED, FORWARD-LOOKING APPROACH TO TELECOMMUNICATIONS REGULATION REQUIRES A DISTINCTION BETWEEN ADVANCED AND BASIC SERVICES

In the current, dynamic telecommunications market, the U.S. needs policies and regulation that are forward-looking to allow our continued leadership in these industries.[2] To fulfill this need, our regulations generally must be based on defining principles rather than rely on case by case

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[1] Gong, Jiong and Padmanabhan Srinagesh, "The Economics of Layered Networks," in Internet Economics, Lee McKnight and Joseph Bailey, eds. (MIT Press: 1997).
[2] Kellerman, Aharon , "Fusion of information types, media, and operators, and continued American leadership in telecommunications," Telecommunications Policy, 21(6): 553-564, 1997.

definitions. In addition, the U.S. needs to develop a consistent structure that encourages innovation while advancing policy goals such as universal service.

A. Information network technology consists of multiple vertically related, or layered services

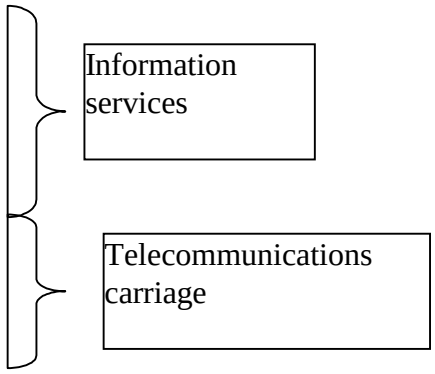
Economists describe the goods and services purchased by consumers as "final" goods or services. In most markets, final goods are produced by firms that, in turn, have purchased goods and services from other firms. These goods and services, inputs to the production of final goods, are called intermediate goods. Economists describe final good producers and intermediate good producers as being "vertically-related." For example, taxi companies buy cars from auto manufacturers and use streets provided by government. We say that taxi services, cars and streets are vertically-related: they are at different layers in a vertical supply chain. They are not competing in the same market.

Information network services consist of chains of vertically related layers.[3] For example, for word-processing a user needs word processing application software, operating system software, and a computer. The application software uses the computer's operating system as an input; the operating system in turn uses the computer hardware as an input. These are layers in a vertical chain, both technologically and economically: applications software does not compete with operating systems software in the market, nor do either compete with computer hardware. Vertically-related products of this sort are also known as complements: users require each of the products, rather than being able to substitute one for another.

Complementary relationships are widespread among telecommunications and information services: fax machines and basic telephone service are complements. Few people without telephone service purchase fax machines and the availability of fax machines increase demand for basic telephone service. The same is true for online services, computers, and basic telephone service.

[3] See Economides, Nicholas , "The Economics of Networks," International Journal of Industrial Organization, 14, 1996 for an overview.

TCP/IP Layer	Service Provided
Application	Data meaning
Transport	Data between applications
Internetwork	Data between hosts
Network Interface	Structured signal over physical media
Physical	Raw signal carriage



This economic structure of complementary, or vertical, relationships is paralleled in the engineering design of communication networks. Layering is the fundamental design principle of modern networks.[4] This is true whether one is providing Internet service (using the 5-layer TCP/IP technology), or OSI data service (7 layers), or an ATM phone network. Each information network system has distinct layers. For our purposes, there are crucial distinctions between telecommunications carriage (the "network interface" layer in the TCP/IP technology) and service (the "internetwork" and "transport" layers).

An ISP such as AOL provides enhanced information services built on top of the carriage layer. When a customer makes a call to AOL and connects her computer to AOL's computers, she will do one or more of the following:

- send a stream of commands to AOL to select options from a menu; AOL's computers interpret those commands, retrieve data from a database, and return the data to the user
- run an application that allows the user to edit stored data files owned by the user
- send commands directing AOL to connect the user to one of millions of databases on the Internet, where the user can fill out forms, and retrieve data, text, image, sound, video and other files
- transfer data files
- and so forth.

[4] "Most networks are organized as a series of layers or levels, each one built upon its predecessor….in all networks, the purpose of each layer is to offer certain services to the higher layers." Andrew Tanenbaum, Computer Networks, 2nd ed. (Prentice-Hall: 1989), p. 9.

All of these services involve more than just carriage. ISPs do not sell carriage *per se*. Accordingly, we should no more view ISPs as carriage providers than we view Yellow Cab as a street provider.

As of April 1995 (the final data for which public statistics were collected), nearly all of the transport on the Internet was for World Wide Web and data file transfer. Less than 5% of Internet service was for e-mail.[5] This date was only about 16 months after the first successful Web browser (Mosaic) was released. Growth in the share of World Wide Web usage has continued. Thus, more than half of Internet services are the provision of data from static stored databases. For all of the hype, the technology and service provided by the Web largely resembles online database services such as Lexis/Nexis and Dialog. Most of the use is for individuals to contact a database, to select files (text, graphics, program code and other types), and to download the file for local viewing or further processing.

B. Horizontal equity for end consumers, and competitive neutrality for service providers, requires that regulation distinguish between layers

Horizontal equity for end consumers requires that the same type of consumers (e.g., residential) are treated the same.[6] All end consumers of telecommunication carriage pay for carriage, including USF contributions, by direct payments to the carriage providers. In particular, end consumers already pay for their local phone connection to an ISP (and thus already pay Universal Service tax on that carriage), and the ISP already pays for local and long-distance lines (and thus already pay Universal Service tax on that carriage). To additionally impose Universal Service tax on ISPs would mean that some consumers — those who use the Internet — would pay the Universal Service tax twice for some of their use of the phone network. Because Internet services are in a different layer than basic telecommunication (indeed, ISPs and their customers purchase basic telecommunication as an input), not distinguishing between them would lead to double taxation.

Competitive neutrality is a generally accepted principle that is necessary for economic efficiency. For example, former FCC Chief Economist Michael Katz advocated it as one of the basic "regulatory principles for competitive markets".[7] Senators Burns and Stevens state that competitive neutrality was a principle "at the heart of the Telecommunications Act amendments."[8] ISPs, because they provide information services, do not compete in the same layer as do basic carriage providers, so there is no concern about competitive neutrality between ISPs and basic carriage.[9] Instead, ISPs compete in a layer with any number of other information service providers, who would not pay the Universal Service tax, and thus ISPs would be competitively disadvantaged. Essentially all of the brief list of telephone-based services below have counterpart services offered online. If ISPs face double taxation or direct USF tax

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[5] Merit Inc. data files. Merit was the contractual operator for the NSFNET. Statistics available at http://www.merit.edu/nsfnet/statistics/. Statistics are for bytes of traffic.
[6] See, e.g., Joseph Stiglitz, Economics of the Public Sector (Norton: 1986), and Harvey Rosen, Public Finance (Irwin: 1985).
[7] In various speeches, including the keynote address at the 3rd Int'l Telecom Systems Conference, Nashville, TN, March 1995.
[8] Letter to William Kennard, FCC, 26 January 1998.
[9] Some have argued that Internet voice services can compete with basic carriage. I address these services below.

contributions, their versions of these services will be competitively disadvantaged compared to these (indirectly- and single-taxed) telephone-based offerings:

- Fax on Demand—customers call in and request that specific documents be sent to them. The consumers can choose from a voice menu, generally, or from a paper menu obtained elsewhere.
- Broadcast Fax—services that send a single fax to a "mailing list" of pre-programmed phone numbers—used for press releases, etc.
- Telephone Banking—bank customers call in to see whether checks have cleared, what their balance is, transfer balances between accounts and similar functions. Credit card companies generally offer similar services, as do brokerage houses
- Newspaper sponsored information line—for example, the Detroit News has a dial in line to check a plethora of sports scores, winning lottery numbers, sale dates for tickets to hot shows, book of the week, a calendar for Showtime!, the ability to check stock prices, and so on.
- Work-management services—Wildfire-type services. Wildfire is a voice activated telephone assistant that can be accessed from virtually anywhere. It offers advanced services like screening and forwarding callers to any phone, announcing new callers when you are already on the phone, and basic voicemail features. It also has a virtual phonebook that includes autodialing capabilities.

There are no economic efficiency arguments that would support treating the traditional telephony-based versions of these services differently than online versions.

C. ISPs buy telecommunication services as an input, and sell information services built on top of telecommunication services as an advanced service to end-consumers

AOL and other ISPs are not telecommunications carriage providers, and thus are not in horizontal competition with such providers. ISPs purchase telecommunications carriage as an input in order to produce their information service.[10]

Importantly, essentially all ISPs provide other additional inputs distinct from basic telecommunications services. Greenstein notes:

> "While some 'pure-ISPs' still exist as of this writing (i.e., they only provide Internet access), it is a widely stated belief within the industry that competitive forces are bidding revenues below the costs of establishing and operating a network that only provides access."[11]

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[10] For a brief description of relationship between ISPs and carriers, see Gong, Jiong and Padmanabhan Srinagesh, "The Economics of Layered Networks," MIT Workshop on Internet Economics, 1995

[11] Greenstein, Shane, 1998, "Universal Service in the Digital Age: The Commercialization and Geography of US Internet Access," Northwestern University mimeo, at http://skew2.kellogg.nwu.edu/~greenste/research/papers/ISPACCES2.pdf on 1/22/98, p. 9

That is, according to Professor Greenstein, ISPs cannot make a profit on the mere provision of access. Rather, they must offer various value-added services to make a profit: storing and retrieving customer information in the form of HTML files ("Web hosting"); providing file storage for customer e-mail accounts; "maintain[ing] servers [that store] software targeted to unique customer needs, compile lists of interesting web sites," and so on.[12] This trend away from access-only ISPs was also noted by Inter@ctive Week in a report that questioned "the plausibility of generating profit on hundreds of thousands of $19.95-per-month accounts."[13] They noted that some ISPs specialize in low-end areas such as "[Web hosting] service bundled with Internet access while others offer "custom integration and advanced system design."[14]

Even e-mail is an advanced "information service" under the definition in the Telecommunication Act of 1996, because it involves generating, processing, storing, retrieving and transforming of information. Indeed, the fundamental Internet protocol for e-mail on the Internet is SMTP[15], which, as with all Internet mail protocols, is a "store-and-forward" system. Mail store-and-forward requires complex processing at every "hop" or router (computer) encountered along a service path. At each hop the "header" or address block is modified by the computer. If a recipient host is temporarily unavailable, the protocol is designed to store and hold the message for at least three days while making repeated efforts to re-deliver. Other advanced operations that involve processing, data transformation, and storage also take place on routine mail traffic.

E-mail service is more akin to U.S. Postal Service than to ordinary circuit-switched voice telephony. The only telephony-based service that it bears some resemblance to is voice mail. It is my understanding that telecommunications carriers are not required to pay USF tax on their voice mail revenues, as they are enhanced services. E-mail is clearly squarely within the definition of an advanced service, built on top of the telecommunications carriage layer. It is not in the same layer of service as carriage, or "basic service."[16]

D. The current FCC plan for Universal Service follows this forward-looking, principled approach

Economists at the FCC have endorsed this forward-looking approach. For example, Joe Farrell, while he was Chief Economist at the FCC, wrote that we should consider "the effects on the growth of competition of adopting a particular rule for when to deregulate. If deregulation will enhance incentives for efficient entry, then in order to get the greatest benefits, it may be necessary to commit in advance to a rule that will seem somewhat 'too deregulatory' in each

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[12] Id.
[13] Barrett, Randy , "ISPs Blaze Diverse Trails Into Changing Market," Inter@ctive Week, 27 January 1998.
[14] Id. See also Steinert-Threlkeld, Tom , "Coming of Age: It Only Gets Tougher For The ISP," Inter@ctive Week, 27 January 1998 for another article describing the growing difficulty in making money from Internet access.
[15] Simple Mail Transfer Protocol
[16] Some have asserted that e-mail is equivalent to paperless fax. This is quite incorrect. One obvious distinction was mentioned above: the network switches will hold email for three days or more if the recipient computer is broken or turned off. That is not true for fax service: the telecommunications carrier does not store the fax transmission and attempt to forward it to the recipient for three days. Perhaps the most important difference is that e-mail can be used for multimedia file transfer, which is not possible with fax. For example, while I was writing this report, my assistant and I worked on opposite sides of Ann Arbor, and exchanged drafts by attaching our Microsoft Word files to email messages that we sent each other. A received file could be opened in Word and edited. That is not possible with fax! The same service can also be used to transfer sound, video, binary data and other files.

instant application." He further wrote "One likely strategy may be to start by deregulating 'new' services, to wall them off from the culture of entitlement. Again, proper consideration of long-run effects may imply a rule that would seem somewhat 'too deregulatory'".[17] The Federal-State Joint Board on Universal Service endorsed using forward-looking cost models to attribute costs to separate layers in information networks and the FCC agreed.[18] I gave an invited speech at the FCC explaining and endorsing this forward-looking approach in July 1996.[19]

E. If we redefine advanced information services as basic carriage, we adopt a backward-looking methodology that will lead to unworkable regulatory gridlock

Information services are being invented continuously, and rapidly evolving. Extending the reach of basic service regulation out of its horizontal layer by selectively applying it to one particular class within a higher, enhanced information service layer opens the door to an endless stream of redefinitions in the future. Each redefinition will yield a new series of procedural and legal proceedings, each slowing the introduction of advanced services.

The current FCC plan distinguishes between the basic carriage layer (telecommunications carriers) and complementary layers that depend on it. The FCC appropriately defines the basic carriage layer broadly in the horizontal dimension, encompassing wire, fiber, and wireless links. The FCC appropriately defines the basic carriage layer narrowly in the vertical dimension, instead of applying carriage-layer duties to content-layer firms. This principled, forward-looking approach is required to achieve the flexibility needed in today's rapidly evolving market.

III. USF CONTRIBUTIONS ARE ALREADY MADE FOR EVERY COMMUNICATION CHANNEL INVOLVED IN INTERNET ACCESS

A. USF support is paid on all telecommunications components of every online session

AOL and other Information Service Providers (ISPs) obtain intrastate, interstate, and international telecommunications services from traditional infrastructure providers, such as AT&T and the RBOCs, as well as from newer infrastructure providers, such as Sprint GTE BBN, MCI and various competitive local exchange carriers. The ISP generally leases some amount of transmission capacity from various telecommunications carriers: transmission capacity from the local switch to the ISP's local network node is leased from a LEC; transmission capacity from the ISP's local node to a regional node or NAP might be leased from a LEC or IXC, transmission capacity between regional nodes is likely leased from an IXC.[20] On leased telecommunications

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[17] Speech at the FCC, "Prospects for Deregulation in Telecommunications", 30 May 1997. Available at: http://www.fcc.gov/Bureaus/OPP/Speeches/jf050997.html
[18] CC Docket No. 96-45, FCC 96J-3, rel. November 8, 1996 and CC Docket No. 96-45, FCC 97-157, May 8, 1997.
[19] The slides are available at http://www-personal.umich.edu/~jmm/presentations/fcc96-layering.pdf
[20] See, for example

- "When an ISP connects to the Chicago NAP they usually purchase the long distance circuit from the Inter-Exchange Carrier of their choice..." Ameritech, *Chicago NAP Technical Information* at http://nap.aads.net/NAP_technical_info.html on 19 January 1998.

carriage, the lessor pays USF contributions on the revenue it receives from the lease. There is no special exemption given to telecommunications carriers for the revenue they earn from providing services to ISPs.

The only telecommunication leg generally not paid for by the ISP itself is the connection between the ISP's customers and their local PSTN switches. However, the ISP customers pay tariffed rates for their service from a telecommunications service provider, and thus pay the USF contribution on that service as well.[21] Through the telecommunications services they use, ISPs make very significant contributions to USF funding. For example, AOL incurred over $900 million in telecommunications expenditures in its most recent fiscal year.[22]

There is no doubt that the leg between the ISP customer and her LEC also results in USF-contributing revenue. That customer pays for her local loop just as every LEC customer pays for his local loop.[23] It would strain logic to argue that the she needs to pay an additional USF donation when she chooses to dial in to her ISP but not when she uses the same phone to call the reference desk at the local library, a current headlines news service, or make airline reservations.

B. There are compelling reasons not to assess USF contribution requirements directly on ISPs

Nearly all commenters seem to agree we do not want to tax advanced information services, although there is some disagreement about what constitutes an advanced information service. Rather, some commenters are suggesting we should tax the ISPs directly on services that use telecommunications carriage purchased as an input, from firms that already pay USF on that revenue. This proposal would be somewhat akin to taxing an automobile manufacturer for the sparkplugs in their automobiles: you could do it, but it is much more efficient to tax the sparkplug manufacturer directly. The latter route is what the FCC has proposed.

There are fundamental reasons why the FCC proposal is the reasonable answer. One obvious and significant impediment is the internal logic of the routers used by ISPs.

Implementing direct ISP contributions to USF will cause problems with present router logic. Making direct USF contributions requires an ability to distinguish intrastate, interstate, and international revenues. ISPs' routers, as presently, universally configured, cannot do this.

- ANSnet's "How we do it" at http://www.ans.net/howedoit/, 19 January 1998.

[21] If a customer has a leased-line connection to her ISP, either the ISP or the customer will negotiate the lease with a telecommunications provider.

[22] See AOL Comments on FCC 96-45 Report to Congress, 26 January 1998, at fn. 65

[23] Some customers have measured rate service, and for them USF contributions are paid on all of the incremental revenue generated by calls to their ISP. Other customers (including me!) obtain a second line solely for Internet usage, so all of the USF contribution on that line is attributable to calls placed to their ISP. Some customers share a single flat-rate line between Internet and other use — it is not a simple matter to determine how much of the USF contribution on that line to attribute to ISP calls, but the appropriate attribution is surely greater than zero. Richard Cawley of the European Commission's DG XIII reports that "about two-thirds" of US residential Internet users have 2nd lines for Internet access (Cawley, Richard A, "Internet, lies, and telephony," Telecommunications Policy, 21(6): 513-532, 1997 at 519), implying roughly 17 million 2nd lines attributable to Internet usage. The RBOCs have frequently attributed the dramatic growth in 2nd lines to demand for Internet access - See AOL Comment on CC Docket 96-45 at fn. 69.

A simple example of what is involved in Internet traffic illustrates the problems: I send e-mail to a colleague, including a copy of a paper I am writing as an attachment.[24] Assume my ISP connects directly to the Chicago NAP. My colleague uses a different ISP that does not connect to the Chicago NAP. To send the mail, my ISP breaks the message into packets. For a message including this paper as an attachment, approximately 360 packets would be required.[25] My ISP's router "knows" only the IP address of each packet. It has no idea where my colleague's e-mail box is geographically located, nor does it know whether the next packet it will handle is part of my message or something completely different. At the Chicago NAP, a route server tells my ISP's router which intermediary ISP will accept a given packet to eventually pass on to my colleague's ISP.[26] Every router the packet traverses knows only the destination address and which connected router is accepting packets for that address. My colleague might live across the street from me or might live in Norway; the Internet is indifferent to this.

Suppose the FCC begins to assess USF contributions directly on ISPs. My ISP is now deeply concerned whether my e-mail is going across my street or to Norway. To differentiate revenues geographically, ISPs must develop a method to determine what part of their traffic travels to each of various jurisdictions.[27] At a minimum this would require creating and maintaining lookup tables containing geographic locations for every host on the Internet.[28] Router software would need to be rewritten to check each packet's destination IP address, compare it to the lookup table to determine if the geographic destination is intrastate or interstate, and in some manner track the amounts of intrastate and interstate traffic. The additional accounting would not only be costly, but would require more processing time for each packet and thus would slow down transmission and reduce service quality on the Internet.

Note that the FCC plan relies on a much simpler method to distinguish between intrastate and interstate telecommunication services: are both "ends" of the "wire" in the same state? If the answer is "no", the telecommunications service revenue generated by that line, whether that revenue comes from a lessee selling automobiles, a lessee selling "chat" time, or analog telephone service, incurs full USF liability. If the answer is "yes", the telecommunications service revenue generated by that line incurs only the Schools, Libraries, and Rural Health Provider liability.

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[24] Herein I abstract from the "store and forward" aspect of email for ease of exposition.
[25] This file is roughly 88,000 bytes. The message part of my mail could be another 2,000 bytes. Packets average 250 bytes of data, giving 360 packets. See Mackie-Mason, Jeffrey K. and Hal Varian, "Pricing the Internet," in Public Access to the Internet, B. Kahin and B. Kelleher eds. (MIT Press, 1994), and "Economic FAQs About the Internet," Journal of Economic Perspectives 8 (1994).
[26] This last is another simplification for illustrative purposes - the routing "decision" must occur for each packet comprising the email message. Different packets of my message could be carried by different intermediary ISPs.
[27] I ignore the additional difficulty posed by tracking which customer sent which packets to which geographic category. However, it seems reasonable to assume ISPs would need to due this, given that the ISPs would incur different costs for different destinations. The natural conclusion is that we would see a reduction in interstate Internet traffic.
[28] Clearly this in itself is no small task: In August 1981 there were 213 hosts attached to the Internet. This had grown to 535,000 by July 1991 and exploded to over 19 million by August 1997. (Network Wizards at http://www.nw.com/zone/host-count-history on 1/22/98.) Each host has a unique Internet address.

A second fundamental problem with assessing USF contributions directly on ISPs is administrative inefficiency.[29] The FCC plan for USF funding will require contributions from essentially the same group of carriers as file TRS worksheets: 3,549 telecommunications carriers.[30] Adding ISPs will more than double the administrative burden: there were at least 4,354 ISPs in Fall 1997.[31,32]

IV. IMPOSING DIRECT USF CONTRIBUTION ON ISPS WOULD BE HARMFUL TO COMPETITION

A. Assessing direct USF contributions on ISPs alone among telecommunication services end users is unfair

ISPs are end users of telecommunications carriage, purchasing it as an input in order to provide advanced information services. There are many other providers of advanced information services who also purchase telecommunications carriage as an input. Fairness would be violated by singling out one class of telecommunication service end users. It would be particularly costly to choose for such treatment one of the most vibrant sectors of our economy.

There is general agreement that ISPs are not telecommunications carriers.[33] This is to be expected, because ISPs are merely another type of telecommunications services end user; unlike

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[29] This observation was made by Eli Noam several years ago. Noam, Eli M, "Beyond Liberalization III: Reforming Universal Service," Telecommunications Policy, 18(9): 687-784, 1994 at 695-696.

[30] The group of telecommunication service firms filing TRS worksheets should be the same group as makes USF contributions - see FCC 97-157 at ¶803

[31] Boardwatch Magazine lists 4,354 ISPs in its Fall 1997 ISP Directory. (Rickard, Jack, ed., *Internet Service Providers*, Boardwatch Magazine, Fall 1997).

[32] Note also that the number is growing rather quickly - Greenstein reports only 3,531 ISPs from his March 1997 survey (which included Boardwatch as a primary source). Greenstein, Shane, 1998, "Universal Service in the Digital Age: The Commercialization and Geography of US Internet Access," Northwestern University mimeo, Table 1, at http://skew2.kellogg.nwu.edu/~greenste/research/papers/ISPACCES2.pdf on 1/22/98, at 17. Boardwatch says its figures, dating to February 1996, show a "nearly linear" growth of 145 ISPs per month over that time frame. (Rickard, Jack, ed., *Internet Service Providers*, Boardwatch Magazine, Fall 1997)

[33] For example:

- "In the *NPRM* [FCC 96-488], we tentatively concluded that ISPs should not be required to pay interstate access charges as currently constituted. ...We stated that there is no reason to extend such a system to [ISPs], *especially considering the potentially detrimental effects on the growth of the still-evolving information services industry*." (emphasis added) FCC 97-158, First Report & Order In the Matter of: Access Charge Reform, Price Cap Performance Review for Local Exchange Carriers, Transport Rate Structure and Pricing, Usage of the Public Switched Network by Information Service and Internet Access Providers, May 7 1997, ¶343.
- "Limited government intervention is a major reason why the Internet has grown so rapidly in the United States. The federal government's efforts to avoid burdening the Internet with regulation should be looked upon as a major success, and should be continued. The Telecommunications Act of 1996 (1996 Act) adopts such a position. The 1996 Act states that it is the policy of the United States 'to preserve the vibrant and competitive free market that presently exists for the Internet and other interactive computer services, unfettered by Federal or State regulation,'" (citing 47 U.S.C. § 230(b)(2)), Werbach, Kevin , "Digital Tornado: The Internet and Telecommunications Policy," FCC/OPP Working Paper No. 29, 1997.
- "It is extremely likely that, had per-minute interstate access rates applied to ESPs over the past 13 years, the Internet and other information services would not have developed to the extent they have today -- and indeed may not have developed commercially at all." FCC 96-488 at ¶285

an IXC and very much like any other network-component lessee. This is most clearly seen in the accompanying Figures.

Figure 1 depicts a typical telecommunications services network with 2 consumers, A and B, located in different cities. One significant point is A's ability to initiate a direct connection to B's location. Another distinguishing feature is that neither IXC is the terminal point for any significant portion of the calls it handles: IXCs are conduits, not destinations.

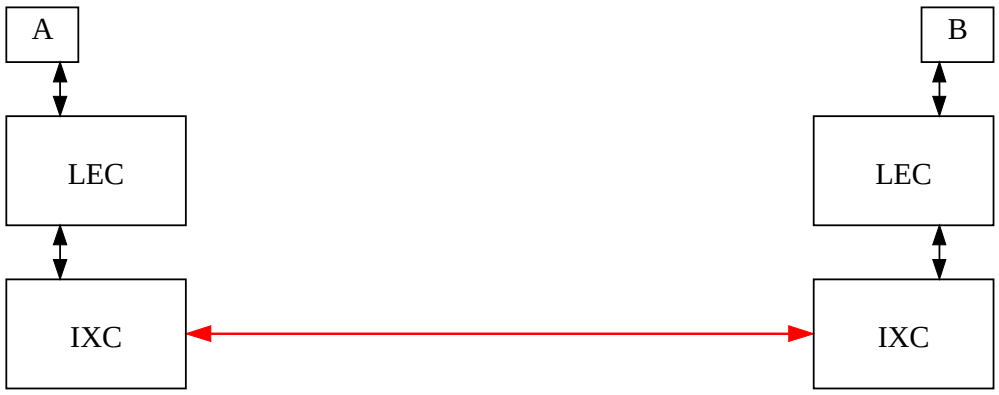

Figure 1, Long Distance Telephone Calling

Figure 2 depicts the Internet with another pair of consumers and their respective ISPs. On both points, the interactions in this network are considerably different than in Figure 1. First, A is unable to initiate direct contact with B. Any contact they have must result from A and B each initiating contact with his respective ISP. Additionally, either ISP can be a destination. This could occur in the obvious way: An ISP can (and often does) provide its own information content, or may host Web pages (and other data files) created by others, each could attract surfers. Likely more important to many of us, our ISPs are destinations for the e-mail we receive: when A sends e-mail "to" B, A is actually sending e-mail to ISP 2, where it is stored. B then (eventually) retrieves his mail from ISP 2.[34]

[34] As discussed earlier, e-mail is a "store and forward" technology, and provides a service that is much closer in nature to postal mail than to basic telephony. In that sense, email is quite similar to voice mail (as opposed to the answering machine you have at home). It is my understanding that voice mail revenues are not subject to USF tax.

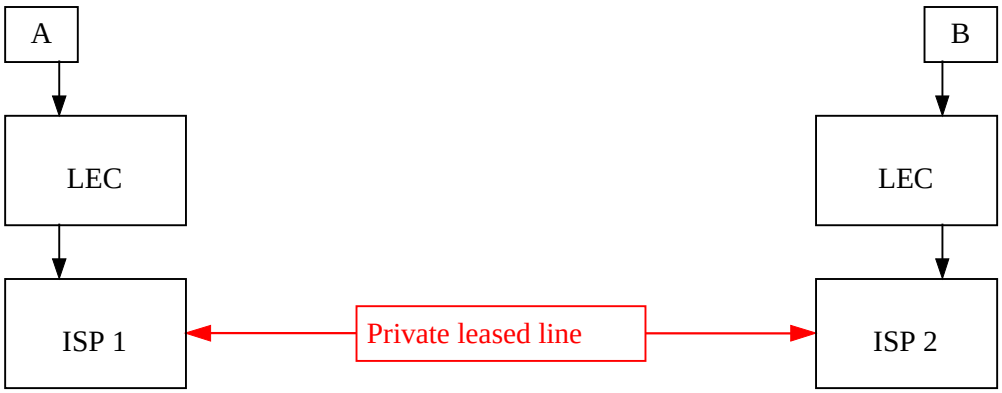

Figure 2, E-mail/Online Traffic

Figure 3 depicts a large corporation, possessing a leased line between two distant plants, and a customer local to one of the plants. Although B is not depicted, it should be obvious that A would not generally initiate direct contact with B via this network. However, A might call Plant 1 and find herself transferred to Plant 2 over the leased line.

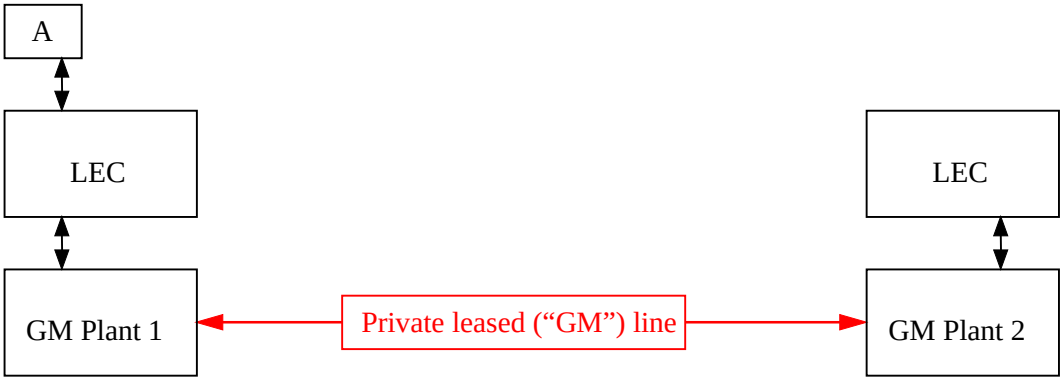

Figure 3, Hypothetical General Motors line

We should no more assess USF contributions directly on ISPs than should we assess USF contributions directly on General Motors. Both are end-users of telecommunications carriage services, and USF is already paid on the telecommunications carriage revenues.

B. Internet telephony is not a boogeyman we need to fear

Some have raised the specter of "Internet telephony" sneaking in through loopholes and stealing the revenue base for Universal Service Funds. Such fears are unfounded and should not guide policy.[35]

Considered comment suggests that Internet telephony will not replace POTS any time soon. In its present state, Internet telephony offers neither the quality nor the ubiquity needed to threaten POTS.[36] Furthermore, any wide-spread implementation of Internet telephony will result in significant changes in the economics of Internet provision, reducing its attractiveness: "A principal conclusion that one reaches...is that ISPs need either to prevent widespread use of Internet telephony, or to change the current pricing structure of Internet access services in order to recover the increased costs" (emphasis added).[37]

Internet telephony in a form aimed at direct competition with POTs is, at any rate, likely to be only a transitional phase that tests demand for the capabilities it can potentially deliver.[38] We need to heed Joe Farrell's advice that we protect new industries from regulation, even if that yields a disconcerting level of deregulation.[39] Our past willingness to champion competition despite predictions of doom to universal services has contributed both to our present success in achieving universal service[40] and our international leadership in telecommunications.[41]

V. LACK OF REGULATION HAS PROMOTED THE INTERNET

The absence of telecommunications carriage regulation for ISPs has had tremendous benefits for the Internet. Internet access "penetration" rates are high, Internet firms are highly competitve and efficient, and US consumers and business are enjoying broadening benefits from the Internet.

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[35] This is not the first time the specter of deregulation and competition destroying universal service has been raised. See Gillett, Sharon Eisner, "Technological Change, Market Structure, and Universal Service," Telecommunications Policy Research Conference, 1994 at 7 for several such predictions, among them (citations omitted):

- "In testimony at the antitrust trial in 1982 Perl predicted that as many as 30% of current low-income consumers might lose service"
- "In 1985, the Consumer Federation of America and the U.S. Public Interest Research Group predicted that the introduction of the SLC would drive 6 million subscribers off the telephone network by 1986."

These outcomes surely did not materialize.

[36] Broersma, Matthew , "The Internet's Calling," ZDNet News, 5 January 1998.

[37] McKnight, Lee W. and Brett Leida, "Internet Telephony: Costs, Pricing, and Policy," Telecommunications Policy Research Conference, 1997.

[38] For example:

- Clark, David D., "A Taxonomy of Internet Telephony Applications," Telecommunications Policy Research Conference, 1997.
- "...the important point is that voice over Internet is likely to develop as part of a whole range of integrated data and voice applications." Cawley, Richard A, "Internet, lies, and telephony," Telecommunications Policy, 21(6): 513-552 at 523, 1997.

[39] "One likely strategy may be to start by deregulating 'new' services, to wall them off from the culture of entitlement. Again, proper consideration of long-run effects may imply a rule that would seem somewhat 'too deregulatory'". Speech at the FCC, "Prospects for Deregulation in Telecommunications", 30 May 1997. Available at: http://www.fcc.gov/Bureaus/OPP/Speeches/jf050997.html

[40] Hausman, Jerry , Timothy Tardiff and Alexander Belinfante, "The Effectsof the Breakup of AT&T on Telephone Penetration in the United States," AEA Papers and Proceedings, 1993 and Hausman, Jerry , "Taxation by Telecommunications Regulation," NBER Working Paper WP 6260, 1997.

[41] Kellerman, Aharon , "Fusion of information types, media, and operators, and continued American leadership in telecommunications," Telecommunications Policy, 21(6): 553-564, 1997.

A. Competition for customers has resulted in widespread availability of Internet access

Competition to get customers has driven public Internet access penetration rates from essentially zero to nearly par with the traditional telephone industry in less than a decade. The free market has done a remarkable job in providing Internet access, with over 87% of US households living in counties that have at least one ISP.[42] Not surprisingly, firms born in the competitive online services industry, and AOL in particular, have been leaders in pushing Internet access out beyond urban centers.[43] This is not the first time economists[44] and other observers[45] have remarked on the ability of competition to drive penetration levels to extraordinary heights.

The success of the competitive market in expanding Internet usage is further evidenced by the extraordinary growth rate in personal Internet use.[46]

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[42] This is an "availability" rate: it indicates the availability of Internet access, not the acquisition of it. Note that this observation is from March of 1997. Given the past experience of growth in this industry, the access penetration rate is undoubtedly higher now. Greenstein, Shane, 1998, "Universal Service in the Digital Age: The Commercialization and Geography of US Internet Access," Northwestern University mimeo, Table 1, at http://skew2.kellogg.nwu.edu/~greenste/research/papers/ISPACCES2.pdf on 1/22/98

[43] Over 17% of AOL's local phone numbers are in rural counties. This is in marked contrast to telecommunications carrier firms' offerings: InternetMCI (2.4%), GTE Internet Solutions (3.6%), Sprint Internet Passport (2.6%), AT&T Worldnet Service (0.0%) or WilTel Internet Services (0.6%). [No RBOC's service had local presence in enough counties to make it onto Greenstein's listing of the top 40 ISPs.] Greenstein, Shane, "Universal Service in the Digital Age: The Commercialization and Geography of US Internet Access," Northwestern University mimeo, 21 January 1998, Table 8

[44] For example:

- Competition had significant success in increasing telephone penetration levels during the competitive phase of the US telephone industry (1894-1921). Thus, by 1920, 86% of Iowa's farms had telephones. Mueller, Milton, *Universal Service*, MIT Press, 1997 at 148.
- "In particular, [cable TV] firms were slow in serving various low-density sub-markets - unless pressed by a competitor in a 'wiring race' to extend local networks. *In many instances, competition succeeded in getting residences wire for cable when 'universal service' mandates imposed on franchise monopolists had failed to work.*" (emphasis added) Hazlett, Thomas W., "Declaration in Support of Bell Atlantic's Petition before the FCC for Relief from Barriers to Deployment of Advanced Telecommunications Services," 26 January 1998 at 10-11.
- Apart from initially giving away broadcast spectrum, radio and television have never received significant subsidies (PBS apart), yet both have higher penetration rates than telephones. Compaine, Benjamin M and Mitchell Weinraub, "Universal access to online services: an examination of the issues," Telecommunications Policy, 21(1):15-33, 1997 at 16.

[45] "...some new industry entrants say that universal service should be regarded as an opportunity rather than a burden. Certainly every country, rich or poor, that has allowed competition has seen telephone density—the number of lines per head—increase. Even in Britain, a mature market, more than 10 percent of the [telephone] subscribers wooed by the cable companies have been people who previously did not have a telephone." Cairncross, Frances , *The Death of Distance*, Harvard Business School Press, 1997, p. 165.

[46] For example:

- According to Cyber Dialogue survey (formerly FIND/SVP's ETRG), there are 41.5 million current, "regular" U.S. Internet users; another 15.9 million in U.S. have tried the Internet within past 12 months and are no longer users. 23.8 million U.S. adults "are likely to sign up" in the next 12 months. 85% of regular users use the Web, 75% use E-mail, 51% use the Internet daily. Research Computer Intelligence estimates U.S. Internet users at 37 million. Nua Ltd. estimates 54 million North American users. Seminerio, Maria , "E-commerce fuels Net growth," ZDNet News, 27 January 1998, http://www.zdnn.com/
- 31.1 million US adults (over 18) are self-described "current" Internet users; over 20 million of them consider the Internet "somewhat" or "very" indispensable". *The 1997 American Internet User Survey*, FIND/SVP Emerging Technologies Research Group, May 6 1997 at http://etrg.findsvp.com/internet/netpr.pdf on 1/22/98
- 63% of adult Internet users paid personally for Internet access, compared to only 39% in 1995. As FIND/SVP put it, "Most current users see enough value today to pay for their own access." *The 1997*

B. A brief look at several economic indicators shows dramatic differences between dynamic ISP firms and the entrenched ILECs

Online computer service firms have far outperformed telecommunications service firms. In Table 1 I report annual growth rates for selected summary variables for the years 1988-1995:

Measure[47]	Online svcs SIC 7375[48]	Telecom Svcs SIC 4813
Total Employment	15.9%	0.4%
Total Payroll	22.7%	4.2%
Total Establishments	19.2%	5.4%
Average Annual Wage	5.9%	3.8%

These are annual growth rates. The cumulative effects of the differences are startling: total employment and wages in the online information industry have almost tripled and more than quadrupled, respectively; in telecommunications, total employment has been stagnant while total payroll is up by just over 1/3. According to government (Census Bureau) Statistics, online services firms created more jobs between 1988 and 1995 than did the telecommunications industry, despite the fact that the telecommunications category employs twenty times as many workers.

The wage growth is indirect evidence of productivity: In a competitive market wages should grow at about the rate of productivity gains. The growth rate in wages in online services has

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American Internet User Survey, FIND/SVP Emerging Technologies Research Group, May 6 1997 at http://etrg.findsvp.com/internet/netpr.pdf on 1/22/98

- 62 million adults, or 30% of the U.S. population (over 16) were online as of the 4th quarter of 1997. This represents 32% growth from one year ago. More than half of computer users are not online. IntelliQuest Worldwide Internet/Online Tracking Service, reported by BusinessWire, Feb. 5, 1997.
- 84% of Internet users consider email "indispensable" Graphic, Visualization, & Usability Center's (GVU) 8th WWW User Survey, GVU Center, College of Computing, Georgia Institute of Technology http://www.gvu.gatech.edu/user_surveys/survey-1997-10/ on 1/22/98.
- In June 1993, there were approximately 130 web sites on the World Wide Web, 1.5% of them were ".com" sites (2 sites). By January 1997, there were an estimated 650,000 web sites, 62.6% of which were ".com" sites (about 407,000). Matthew Gray of the Massachusetts Institute of Technology at http://www.mit.edu/people/mkgray/net/printable/web-growth-summary.html on 1/22/98.
- In August 1981 there were 213 computers attached to the Internet. This had grown to 535,000 by July 1991 and exploded to over 19 million by August 1997. Network Wizards at http://www.nw.com/zone/host-count-history on 1/22/98.
- In 1990, consumers spent 12 times as many hours and 8 times as many dollars on watching movies in theaters as they did on Internet access/online services. By 1997, they were expected to be roughly at parity in both categories. By 2000, consumers were projected to spend 2 1/3 times as many hours and 1 ¾ times as many dollars on Internet access/online services as on watching movies in theaters. *Statistical Abstract of the United States*, US Census Bureau, 1997, Table 887, citing data from Veronis, Suhler & Associates Inc., New York, NY, "Communications Industry Report".

[47] Data from *County Business Patterns*, US Census Bureau, 1988-1995 (years prior to 1988 used a different SIC classification system, making it difficult to ensure comparability).

[48] SIC Code 7375 is "Information Retrieval Services, Establishments primarily engaged in providing on-line information retrieval services on a contract or fee basis". SIC Code 4813 is "traditional" telephone communications. US Census Bureau definitions, available, respectively, at http://www.census.gov/epcd/www/sc92sics.html#S0096 and .../uc92sics.html/#U0160

been about 50% higher per year, suggesting much higher productivity gains. Looked at differently, average wages in online services have increased almost 50% while wages traditional telecommunications are up less than 30%.

C. The Internet has brought significant economic and social benefits in an unregulated environment

With the spread of Internet use, we are also seeing growing evidence of its value. One study suggested that using the Internet improved students' information analysis and presentation skills.[49] A study of a dedicated fiber optic network installed by the State of Iowa found its students and employees benefited.[50] A study by the RAND corporation concluded that the social benefits of e-mail were sufficiently high to justify full "universal service" status.[51]

Businesses are likewise singing the praise of the Internet. Both retail and business-to-business e-commerce are growing at extraordinary rates.[52]

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[49] In a controlled study specifically intended to distinguish between value of online use and technology use in general, the authors found that online use increased the learning of students and their teachers. It also appears that online use led teachers to use the computers as "to enhance [student] performance directly, in gathering, organizing, and presenting information" rather than merely to teach basic skills or as a reward. (p. 22) Follansbee, Sari , et. al., "The Role of Online Communications in Schools: A National Study," Center for Applied Special Technology report, 1996.

[50] Iowa installed a state-funded fiber optic network beginning in 1991. Response phenomenal - by 1996 106,000 hours of video were transmitted; expected to double in 1997. Caristi, Dom , "The Iowa Communications Network: The Policy Implications of Publicly Funded Infrastructure," Telecommunications Policy Research Conference, 1997.

[51] "To those on-line, e-mail provides a general—often substantial—increase in effectiveness, productivity, and access to relevant information." Anderson, Robert H., et. al., *Universal Access to E-Mail: Feasibility and Social Implications*, Rand, 1995 at iii

[52] For example:

- There were 2.6 million online purchasers in the 2nd Quarter '96, growing to 8.7 million, expected to spend $7 billion annually, in the 3rd Quarter '97. IntelliQuest Worldwide Internet/Online Tracking Service at http://www.intelliquest.com/about/release37.htm on 1/22/98
- Forrester research predicted 4th quarter 1997 would register $750 million in online retail sales and post-Holidays said sales for the quarter might have reached $1 billion. International Male, a San Diego-based men's clothing store, reported online sales 2600% higher in December 1997 over 1 year earlier, 1997 sales 500% above 1996. AOL merchants reported an average 200% year-on-year increase. A PointCast Inc. random E-mail survey of 5000 users found 40% had made an online purchase "this Christmas". "People were purchasing a lot more big ticket items, such as $1,000 televisions and $3,500 treadmills." Duvall, Mel , "Web Registers Still Ringing in '98," Inter@ctive Week, 19 January 1998.
- Cisco online sales were expected to reach $3 billion in 1997. Dell computer sells $3 million per day at its web site. Clark, Tim , "Net earnings: E-commerce in 1997," News.com, 24 December 1997, http://www.news.com/
- "Internet commerce will grow at a breakneck pace during the next four years, with the value of goods and services traded between companies skyrocketing from $8 billion this year to $327 billion in 2002", according to Forrester Research (28 July 1997, http://www.forrester.com/press/pressrel/970728BT.htm).
- "The effect on businesses of this hypergrowth of electronic trading will be unprecedented efficiency in trading processes. The billions of dollars generated on the Internet will spawn a new dynamic trading process." Forrester Research (28 July 1997, http://www.forrester.com/press/pressrel/970728BT.htm)
- "With Internet commerce already headed for $8 billion in 1997, up 1,000% from 1996, Forrester looked at which industries are at the center of the dramatic growth. Three different company types were identified: manufacturers, chiefly in electronics and airplane parts (like Cisco and Boeing) represent 38% of all Internet business in 1997, a total of $3 billion; middlemen, computer-related and office supplies (MicroAge and Boise Cascade) total $2 billion in 1997; and services and utilities (QuickTrade

VI. THE INTENT OF USF IS TO BENEFIT CONSUMERS; THE GREATEST BENEFIT FOR CONSUMERS WILL COME FROM HAVING THE WIDEST POSSIBLE CHOICE OF PROVIDERS

The 1996 Act does anything but promote closed, protected, monopoly markets as being in the best interest of consumers. The fundamental economic premise of the 1996 Act directly rejects the proposition that telecommunications customers would be better served if they are forced to choose among a very limited group of providers. But this is exactly the position taken when one argues that only contributors to the Schools, Libraries, and Rural Health Providers Advanced services fund should be allowed to supply those advanced services.

Customers are best served by a competitive, open market, regardless of whether the consumer is spending her own money or is purchasing subsidized services. Indeed, consumers are on the record as wanting a choice of providers.[53] Attention to the benefits of free choice and open competition led two researchers to suggest that Canadian telecommunications deregulation would yield results faster than the American variety.[54] Grieve and Levin argue that Canada's effort is based on economics and antitrust principles while the US effort is grounded in a public utility regulation approach.

There is no reason the question of who is eligible to provide advanced services subsidized by the Schools, Libraries, and Rural Health Provider fund should be connected to the question of who funds the subsidy. To argue that providers of USF-subsidized services should be limited to those who were taxed to provide USF funding has no basis in standard tax principles. Such a restriction would be akin to requiring that the tax revenues to fund food stamps be raised entirely from grocery stores.[55]

VII. SUMMARY

There is widespread agreement on certain fundamental principles relevant to the assessment of USF taxes. One agreement is that a leading principle in the Telecom Act of 1996 is to ensure competitive neutrality. This requires that all firms who compete horizontally with each other be taxed identically, lest some gain competitive advantage. Internet service providers are not horizontal competitors with telecommunications carriage companies, and thus there is no

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and Altra Energy) total $3 billion." Forrester Research (28 July 1997, http://www.forrester.com/press/pressrel/970728BT.htm)

[53] See Missouri Public Utility Commission Comment on FCC 96-45 Report to Congress, 26 January 1998.

[54] Grieve, Willie and Stanford Levin, "Telecom Competition in Canada and the U.S.: The Tortoise and the Hare," Telecommunications Policy Research Conference, 1997.

[55] Jerry Hausman suggests that there is a standard efficiency argument for requiring all providers of USF-subsidized services to also be USF contributors (Hausman, Jerry , "Taxation by Telecommunications Regulation," NBER Working Paper WP 6260, 1997). His is the standard public finance argument that the broader the base for a tax, the less distortionary is the tax. Although the general point has merit, it is not a point about requiring USF-subsidized providers to be USF contributors. The point is simply that broad taxes are more efficient than narrow taxes. By this argument, the USF should be funded out of general revenues, levied (say by income tax) on the entire population. Congress rejected this option.

argument to tax them to restore competitive neutrality with carriage providers. On the other hand, ISPs do compete with a large number of other information services that do not pay USF tax (e.g., "sports phone" lines). Singling out ISPs for taxation, from among the many horizontally competing information service providers, would violate competitive neutrality.

There is also widespread agreement that the USF tax should not lead to double taxation. However, a USF tax on ISPs would do precisely that. Every telecommunication line used by AOL, for example, is leased, and USF taxes are already paid on the leased revenues. Likewise, all of the calls placed by customers to a local ISP facility are tariffed at standard rates. Thus, USF taxes are paid on all of the telecommunications carriage that is purchased by ISPs.

Imposing new taxes on ISPs would hurt consumers and would slow the growth of this precious national asset.

If Internet access services are to be subsidized with the USF, then the permissible providers should include all firms capable of providing vigorous competition, not just the fewer firms who were taxed for the USF. Consumers are better off with more choice and more competition.

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